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Newly Discovered Bio-Control Agents Kill Sparganthis and Cranberry Fruitworm: Preliminary Data on Native Nematode Species

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Historically, two of the most destructive insect pests in Wisconsin have been the Cranberry Fruitworm (CFW) and the Sparganthis Fruitworm (SFW). At the last two WSCGA Winter Meetings (2014, 2015), growers ranked CFW as public enemy #1 on the marsh, followed closely by SFW. While SFW is readily controlled with a variety of insecticides, CFW is a different story. There are a handful of reasons why CFW is such a difficult pest to control: A) pre-bloom sprays do virtually nothing against the pupae, which are safely nestled into the duff/soil of the bed; B) bloom-time sprays for adults run up against pollinator issues; C) adults emerging days or weeks after a spray are not controlled and go on to lay eggs; D) caterpillars hatch from eggs and go straight into the fruit; E) larvae are safely hidden within fruit during virtually all of their feeding (Dan Mahr, Cranberry Fruitworm factsheet). So, the window of opportunity to kill these little beasts is very narrow. Once they've hatched, it's a lot like "trench warfare," where we throw various weapons at the enemy, but most of them miss. Many Wisconsin growers are interested in supplementing their insecticide applications with alternative control tactics.

A recent survey of nematode species in central Wisconsin's wild cranberry habitat may have provided such an option.

Three (3) strains of entomopathogenic nematodes have been recovered from Jackson County, Wisconsin (one is pictured in Figure 1).

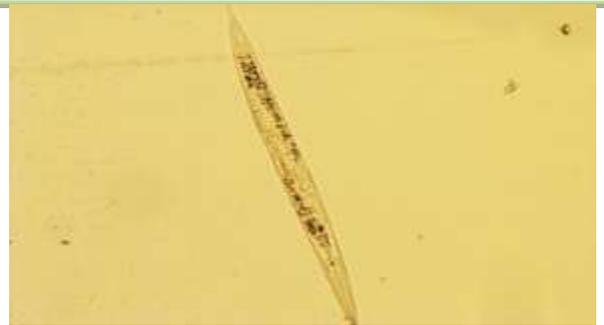


Figure 1. A new insect-eating nematode species, native to Wisconsin marshlands (collected in Jackson Co., summer 2015.)

The nematodes were collected by a standard bioassay technique from moss-covered soils and peat, in close proximity to wild cranberry plants. All three nematode strains have been shown to attack Sparganthis Fruitworm (Fig. 2), and all seem similar in their virulence (ability to kill the host).



Figure 2. Dead Sparg caterpillar, killed by nematodes. Note small pale nematodes (indicated by arrows) emerging from the caterpillar's head.

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Based on preliminary trials, these nematodes are quite virulent, killing over half the SFW within just three days of treatment, at doses less concentrated than typical nematode applications. At higher doses and longer host exposure-periods, mortality rises dramatically, but our early trials are aimed at simply showing that the nematode can kill SFW. It remains to be seen whether or not these 3 nematode strains will be an effective bio-control agent for SFW, but given that the nematodes in our trial had to search out their prey before killing them, there is reason to be optimistic.

In the case of the Cranberry Fruitworm (CFW), one of the three nematode strains was able to kill larvae and/or pre-pupae that had finished feeding, tunneled into cotton, and spun a pupal case (Fig. 3). What's interesting about this particular nematode strain is that in order for it to get access to the CFW larva, it had to crawl through the thick pupal case first.



Figure 3. CFW caterpillar within its pupal case (greenish head is protruding). Nematodes crawl through the silk mesh of the pupal case, then attack the CFW larva within.

After penetrating the defenses of CFW, the nematode infects the caterpillar, consumes it, and spills out in the thousands (Fig. 4). So far, this particular nematode strain is the only one that kills both SFW and CFW.



Figure 4. Nematodes emerging from CFW cadaver. Nematodes (pale, threadlike worms) can be seen swimming away from the dead caterpillar.

Historically, similar nematodes have been used to successfully control the Cranberry Girdler, and also the Cranberry Root Weevil. Despite these successes, nematodes are rarely used on Wisconsin's cranberry acreage. This percentage might increase if a nematode that is better suited to the Wisconsin climate could be made commercially available, and since the recently discovered strains are native to Wisconsin, they are clearly well-suited to the Wisconsin climate.

Although Sparganothis and Cranberry Fruitworms are most infamous for the damage they do to cranberry tissue above the surface of the soil, both of these pests spend at least part of their life cycles on/in the soil. It is possible that a well-timed application of the soil-dwelling nematodes could bring the pest and the pathogen into contact. After the nematodes infect the insect, they release symbiotic bacteria into the host that kills the insect, and the nematodes then use the cadaver as a space to feed and breed. Thousands of nematodes have been recorded coming from a single infected SFW cadaver, so it may be possible for one application to increase nematode populations in the soil, providing pest protection season-long.

Efforts are currently underway to find other native nematodes. Studies are also being conducted to better understand how well these nematodes can move through the soil profile, effectively hunting down various insect prey. Despite the large amount of work that will need to be done to screen these nematodes, it is noteworthy that after a single summer of searching, we have already found three strains that attack two major cranberry pests, and possibly more. If an efficient method of rearing these nematodes can be developed, then native nematodes may become a new bio-pesticide for Wisconsin's cranberry IPM systems.

Observations from the field
Jayne Sojka/Lady Bug IPM, LLC

Observations from the field:

Last week I was out collecting berries for a study and was quite impressed with the weight difference in a two week interval! Some berries are now weighing in at 1.3 grams each. We have had ideal weather for sizing and weight gain; cranberries just love that hot/humid weather. Our challenge right now is that color/tAcy is slowly coming on. We've heard a lot of tAcy numbers being in the upper teens (16-18) but growers are anxious to get harvest going. It may be awhile yet before those numbers are acceptable and harvesting can begin.

As you start harvesting, pay attention to your harvest equipment- mainly tracks and the pressure on the vines. We hope to have a grower panel presentation at Cranberry School this upcoming winter on those kinds of stresses and the impact to harvest. It is our plan to share success stories of what can be done differently to avoid low crop stripes. Please make notes, take pictures, and be ready to join in on Industry challenges and solutions with new technology. We can all benefit from learning additional strategies to make harvest more efficient and smooth, and not suffer any repercussions of lasting damage.

When you harvest and rake out the trash, please do not put it right back on the marsh. I have seen challenges reintroduced to the marsh because of disease in that trash. If you place the trash downwind of the marsh, a disease can be spread to the beds during the next summer. We try to clean up our beds and get rid of cottonball issues by these trash floods both in the fall and again in the spring. The key to success is to eliminate the problem. Composting or removing it completely from the site will help to ensure that your hard work and dedication pay off.

As many of you know, elk were introduced to Jackson County earlier this season. Well we are now hearing of visits from these grazing animals. One visit would be enough but some of these four-legged hungry critters have been frequenting our marshes. Keep a watchful eye out on your properties as I understand that they travel quite far in any given day.

Have a wonderful harvest.

Jayne Sojka/Lady Bug IPM, LLC

Cranberry Journal—Grower Update

Manitowish Cranberry Co., Inc.

The trees are starting to change colors, the mornings are cooler, and the sun sets earlier and earlier; fall is finally here! The warm temperatures we have had helped size our fruit, but we could still use cold nights to color the berries more. Our early varieties, Crimson Queen and Ben Lear, have high sugar levels, so we knocked off 35 acres yesterday with our harrow and will start harvest tomorrow.

I am hoping our Stevens will color quickly so by the time we are done harvesting our early varieties we can continue on to the Stevens and we won't have to stop harvest for a few days. If they continue to color at the rate they are now, all should go to plan and we will be done with harvest in three weeks and we can shift our focus to our post-harvest projects.

We are replacing our above ground, aluminum mainline on our 45 acre "Alder Lake" property with underground, plastic mainline, which was fused together last week and is now waiting to be buried. We have finished our plans for the two beds we are renovating, including the current elevations, desired elevations, and number and lengths of drain tile and irrigation lines. We will have a very busy fall!

Happy harvest!

David Bartling
Manitowish Cranberry Co., Inc.

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